Patented Aug. 29, 1933

1,924,967

UNITED STATES PATENT OFFICE

1,924,967

PROPELLANT POWDER AND PROCESS OF MAKING THE SAME

William E. Wagner, Alton, Ill., assignor to Western Cartridge Company, East Alton, Ill., a corporation of Delaware

No Drawing. Application December 8, 1930
Serial No. 500,875

7 Claims. (Cl. 52—20)

This invention relates to propellant powders, and more particularly powders of the type which are surface-treated with a deterrent to retard the initial burning rate.

One of the objects of this invention is to provide a process of surface-treating propellant powders, and more particularly double base propellant powders, adapted to improve the ballistic characteristics of such powders.

Another object is to provide a propellant powder, and more particularly a double base propellant powder which is surface-treated with a deterrent, and more particularly diamyl phthalate, in order to secure the desired ballistic properties.

Further objects will appear from the detail description, in which will be described as illustrative embodiment of this invention; it is to be understood, however, that this invention is susceptible of various other embodiments.

Generally stated in accordance with this invention, the powder grains are treated with a deterrent carried in a volatile vehicle, which is a solvent for the powder grains, and preferably a mild solvent; the vehicle is then evaporated. In accordance with one embodiment of this invention, the deterrent is carried by only sufficient of the vehicle to wet the powder grains. The evaporation is carried on at a low temperature and preferably by dependence on the vapor pressure of the vehicle; this may be accomplished by evaporating with a large quantity of air. The process is so controlled that contact of the deterrent carrying vehicle and its evaporation are so governed as to carry the deterrent into the grain sufficiently to secure the desired ballistics.

In order to generally accomplish the objects of this invention, the deterrent may be one of the usual ones employed. A deterrent which has, however, been found particularly useful is diamyl phthalate. A related deterrent, such as dibutyl phthalate, may also be employed. Moreover, other deterrents, such as tricresyl phosphate, ethyl lactate, dimethyl-diphenylurea, and mono, nitro, dinitro and trinitro toluene, may be employed.

It will be understood, of course, that suitable solvents may be employed adapted for the particular deterrents chosen and the particular powder under treatment.

Many of the advantageous features of this invention may be secured by the surface treatment of smokeless powder grains generally, when employing the process embodying this invention. This invention is, however, particularly applicable for the surface treatment of double base powders. It is, however, desirable that the double base powder grain contain its original nitro-glycerine content, as distinguished from abstraction of part of the nitro-glycerine from the grain prior to the application of the deterrent. A surface treated nitro-cellulose-nitro-glycerine powder grain, which is of particular utility is one containing 15% nitro-glycerine and 6% diamyl phthalate.

As an illustrative embodiment of this invention, a nitro-cellulose-nitro-glycerine powder grain containing 15% nitro-glycerine is surface treated with diamyl phthalate in the following manner: The deterrent is carried in the vehicle, such as methyl or ethyl alcohol, which is a mild solvent for the powder grain, and only sufficient of the vehicle is employed to just barely wet the surface of the mass of powder grains being treated. Deposition of the deterrent is accomplished by evaporation of the vehicle. The powder is, therefore, subjected to a temperature sufficient to evaporate the vehicle. It is desirable, however, to secure evaporation at a low temperature, not only to prevent sticking together of the grains, but to prevent explosion. In accordance with this invention, therefore, the evaporation is proceeded with at a low temperature, using a large quantity of air and depending upon the vapor pressure of the vehicle at the low temperature to accomplish the evaporation. This temperature may be as low as 15° C. The process is so governed that the contact of the deterrent-carrying vehicle and its evaporation are such as to carry the deterrent into the grains sufficiently to secure the desired ballistics, but to avoid carrying the deterrent further into the grain than is desired. The grains can finally be graphited.

There is thus produced a powder grain, and more particularly a double base powder grain, which not only has the desired ballistic properties, but which can be made progressive burning to the desired extent. It will be understood of course, that suitable means is provided to recover the solvent in a manner well-known to those skilled in the art.

It will be understood that while this invention is particularly applicable to the treatment of double base powders, some of its features are of advantage in the surface treatment of nitro-cellulose powders and smokeless powders generally. It will further be understood that various features and subcombinations are of utility and may be employed without reference to other features and subcombinations; that is contem-

plated by and is within the scope of the appended claims. It will be further understood that various changes may be made in details without departing from the spirit of this invention; it is therefore understood that this invention is not to be limited to the specific details described.

Having thus described the invention what is claimed is:

1. In the art of making propellant powders, the process comprising, treating powder grains with a deterrent carried by only sufficient of a highly volatile vehicle to wet the powder grains, and evaporating the vehicle, the contact of the deterrent-carrying vehicle and its evaporation being controlled to carry the deterrent into the grains sufficiently to secure the desired ballistics.

2. In the art of making propellant powders, the process comprising, treating powder grains with a deterrent carried by only sufficient of a volatile vehicle to wet the powder grains, which vehicle is a solvent for the powder grains, and evaporating the vehicle, the contact of the deterrent-carrying vehicle and its evaporation being controlled to carry the deterrent into the grains sufficiently to secure the desired ballistics.

3. In the art of making propellant powders, the process comprising, treating powder grains with a deterrent carried in a volatile vehicle, which is a solvent for the powder grains, and evaporating the vehicle at a low temperature by a large quantity of air, the quantity of air being regulated to control the evaporation of the vehicle and the penetration of the deterent in the grain.

4. In the art of making propellant powders, the process comprising, treating powder grains with a deterrent carried in a volatile vehicle. which is a solvent for the powder grains, and evaporating the vehicle, the contact of the deterrent-carrying vehicle and its evaporation being controlled to carry the deterrent into the grains sufficiently to secure the desired ballistics.

5. In the art of making propellant powders, the process comprising, treating powder grains with a deterrent carried by only sufficient of a volatile vehicle to wet the powder grains, which vehicle is a solvent for the powder grains, and evaporating the vehicle, the contact of the deterrent-carrying vehicle and its evaporation being controlled to carry the deterrent into the grains sufficiently to secure the desired ballistics.

6. In the art of making double base propellant powders, the process comprising, treating double base powder grains with a deterrent carried in a volatile vehicle, and evaporating the vehicle, the contact of the deterrent-carrying vehicle and its evaporation being controlled to carry the deterrent into the grains sufficiently to secure the desired ballistics.

7. In the art of making propellant powders, the process comprising, treating powder grains with a deterrent carried in a volatile vehicle, which is a solvent for the powder grains, and evaporating the vehicle at a low temperature by a large quantity of air, the contact of the deterrent-carrying vehicle and its evaporation being controlled to carry the deterrent into the grains sufficiently to secure the desired ballistics.

WILLIAM E. WAGNER.